World of Ideas

a monthly feature by
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A LOOK AT THE WORLD AROUND US

30 Meters and WARC Bands Revisited

Approximately 2½ years have passed since our first WARC-acquired band was opened for use by U.S. amateurs, and the overall returns to-date have been extremely gratifying. Thirty meters has proven to be the ideal HF area for personally developing and evaluating various types of antennas and equipment, and the DX situation is more "enjoyable QSO" rather than mere "report exchange" oriented. The band is fantastic! This 10.1 MHz spectrum has also become popular among financially restricted youngsters and limited budget retirees—an attractive combination for perpetuating our quality amateur standards. The common denominator in each of the above areas is obviously 30 meters' "power equalizing effect" resulting from a 200 watt limit, and the band's unique location in the HF spectrum.

Since everyone uses barefoot gear, noticeable emphasis is placed on effective home-constructed antennas. Additionally, QRP rigs, direct conversion receivers, and modified older equipment is usually capable of good performance on 30 meters. Although some of those items might also be used on 40 or 20 meters, the power ratio of a few watts in a 1500 watt world isn't very encouraging odds. Older rigs and basic-design receivers also tend to "drop off" in performance around 12 or 13 MHz. Personally, I've "spare time" worked over 20 countries on 30 meters while using a pocket-size 2 watt transceiver. You could probably do better.

What other attractions does our only low-power band offer? A relaxed and friendly atmosphere with propagation that's a "cross" between 40 and 20 meters, a band that's relatively open during many daylight and evening hours, a recluse from hectic contest activities on other bands, and a dandy way to enjoy a good electronic keyer or classic bug (watch for more inspiration on bugs in next month's column. We're planning a special tour of the K5RW key collection/museum).

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Watching 30 Grow

Amateurs in all areas of the world are enthusiastic over our new 30 meter band. South African amateurs are group-constructing direct-conversion QRP transceivers from club-available kits. Australian and Pacific area amateurs are joining 30 meters in increasing numbers. Even OSCAR 10 operators are being heard on 10.1 MHz when the satellite isn't in range of their QTH. From the European side, Anthony Quest, G4UZN, reports that substantial 30 meter activity encouraged him to create a "WARC bands club" complete with quarterly newsletter (air mailed) and attractive membership certificate. The yearly fee is $10 U.S., and everyone is invited to join. His address is 445 Street Lane, Leeds, LS17, 6HQ, England. Tony also reports hearing many U.S. stations working one another in the informal "DX window" of 10.100 to 10.104 MHz with each asking "Where's the DX?" One way propagation? Doubtful. He's probably experiencing the "listen later" antics of 40 meter operators trying 30. You've heard the ritual: You call CQ on a clear frequency, then three seconds later another right-on-frequency operator calls CQ. You answer him, and the exchanged reports are 599. May such trends never invade 30 meters!

As this column is being written, the full 30 meter spectrum (10.100 to 10.150 MHz) has just been opened to U.S. amateurs. Some teletype and buzz saws continue frequenting 10.130 MHz, but they make convenient band markers and propagation beacons. The FCC has also filed a Notice of Proposed Rule Making (PR 84-960) which advocates raising 30 meter's power limit to 1500 watts. Since that expansion would ruin the true beauty of this unique band, I filed a formal reply requesting our low 30 meter power limit

Fig. 1– The coaxial double bazooka antenna as originally designed for 20 meter operation, and presented in K9EID's Ham Radio Handbook. *Text explains easy method of scaling for 30 meters. Skywire doesn't require external balun and works like a champ.*

be retained. Surely we'll be allowed to continue proving our abilities to design our own setups and communicate worldwide using minimum power levels. Will we succeed? The closing date for PR 84-960 replies was December 15, 1984, with resultant action due by late spring 1985. Time will tell.

Equipment Ideas

While recently manufactured amateur transceivers include easily enabled WARC band coverage, a number of individuals have elected to "go their own route" in this area by using separate transmitters or converted CW setups for 30 meter operation. This approach has opened several interesting avenues of pursuit: using "classic" rigs such as the Johnson Ranger or Navigator (remember the unique sound of time sequence keying?), constructing ever-popular "one tubers," or adapting QRP setups detailed in various handbooks and magazine articles. Several amateurs have reported these ventures as being their first true "hands on" experience with circuits, and that kind of incentive is commendable in any light.

Converting tuned circuits in basic or older amateur gear for 30 meter operation can usually be simplified to shifting 40 meter tank coil taps between 20 meters and their original (40 meter) positions, or adding extra capacitors in parallel with 20 meter capacitors. In fact, the wide tuning range of many older transmitters often covers 30 meters without modifications. Rather than retuning VFOs for new band coverage, try installing a freshly purchased crystal for 10.108 or 10.120 MHz and "warping" them with a tuning capacitor—the modern "VXO concept." Many older receivers cover the full HF spectrum. However, ham-band-only receivers can be 30 meter converted by coil-tapping or capacitor-padding their 40 or 20 meter RF input circuits and changing heterodyne oscillator crystals. The general concept of "beating" incoming RF and local oscillator signals to produce a particular IF difference was exemplified in last month's column ("Understanding Modern Amateur Gear"). Just adapt those ideas to your own rig.

There are a variety of "specialty areas" one can pursue in 30 meter activities: mobile operations with a good programmable memory keyer, resurrecting vintage gear such as units described by W6SAI in past issues of *CQ*, or maybe constructing your own microsize DX rig. Have you thought of building a 30 meter transmitter in a ballpoint or felt-pen case? Radio Shack sells RF coils and cigarette-lighter-type 12 volt batteries that are quite small. Add an oscillator-slaved direct-conversion receiver in another pen case, and the "set" makes a complete rig. Maybe a Golden thirties-style setup using number 10 or 46 tubes and a matching receiver with genuine blue envelope valves would pique your interest. The classic model Champion bug is still manufactured by Vibroplex, and it would really complement that setup. Need some more ideas to kindle your thoughts? Check our brief list of "imagination expanders" shown below.

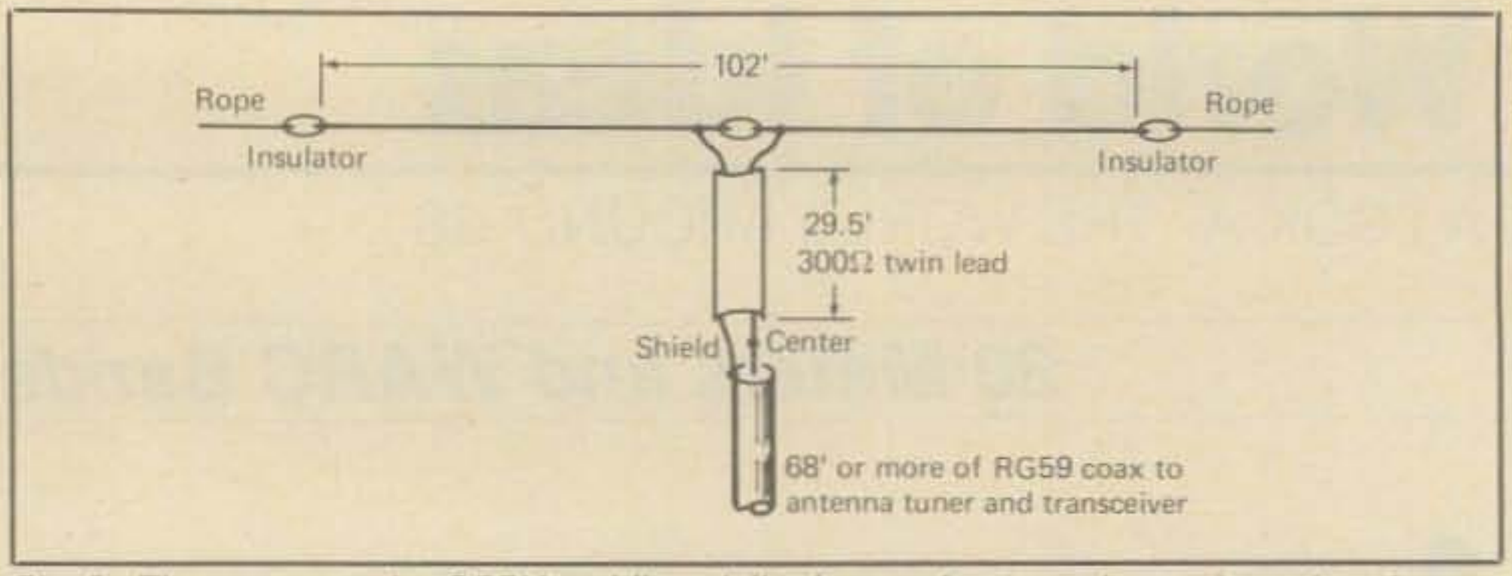

Fig. 2– The ever-popular G5RV multiband dipole—an inexpensive and good performer for 80, 40, 30, 20, 15, and 10 meters. Any antenna tuner which will match coax inputs is recommended.

- "A 50 Watt 1934 Style Transmitter," W6SAI, November 1971 *CQ*.
- "A 2-Tube DX Receiver," W6SAI, June 1972 *CQ*.
- "A 210 TNT Transmitter for 80 Meters," W6SAI, January 1973 *CQ* (circuit also in 1930's *ARRL Handbook*, with coils for 40 and 20 meters).
- "A One Tube 10 Watt Transmitter," W6XM, June 1983 *CQ*.
- "The Viking 4 Watt 20 Meter Transceiver," W0RSP, August 1980 *CQ*.
- "A 2 Chip CW Transmitter," W0XI, October 1981 *CQ*.
- "The QRP-30 Transceiver," K4TWJ, June 1983 *CQ*.
- "WARC-Enabling Modern Rigs," K4TWJ, February 1983 *CQ*.
- Additional Ideas Sources: *QRP Handbook* by W0RSP, *Solid State Design for the Radio Amateur* by ARRL, *Weekend Projects for the Radio Amateur* by ARRL. Also check archives sections of your local libraries.

A Wire Antenna Haven

Remember those bargain-priced rolls of insulated hookup wire, coax, and twin lead that seem to appear in nearly every hamfest fleamarket? The gauge may be thin for kilowatt rigs, but it's great raw material for 30 meter antennas. What kind of array to build? That depends on your available room and ingenuity in shooting fishing lines over tree limbs. Full-wave loops, Bruce arrays, and two-element wire beams always radiate a respectable signal. Phased verticals made with wire elements or various types of longwires are another possibility. Some interesting designs for wire antennas are also presented in older handbooks (or in my upcoming *Wire Antenna Handbook*. It should be published within the next few months.). So you're saying many published designs were before the days of WARC bands? I'll explain an easy way to modify any (single band) antenna's dimensions for 30 meter operation, then leave the area open to your creativity.

Antenna formulas are interesting in the respect that any two known variables can be used to find an unknown third variable. This is done by rearranging their parameters into a "circle formula" and substituting a "times" sign for their "equal" marks. The formula F(MHz = 234 ÷ ¼ wavelength (feet), for example, is rewritten in fig. 1 as 234 ÷ F(MHz) × ¼ wavelength (feet). As an example of its use, let's plug in some figures we all recognize: 234 ÷ 14.0 MHz = 16.714 feet (used for finding length of ¼-wave antenna). Also, 234 ÷ 16.714 feet = 14.0 MHz (useful for finding the resonant frequency of "5 percent longer" reflectors, "4 percent shorter" directors, velocity factor-cut transmission lines, etc.). Likewise, 14.0 MHz × 16.714 feet = 233.996 (useful for finding a "common parameter" for scaling various book and magazine-presented antenna lengths to other frequencies. Nearly every electronic formula can be "fanagled" similarly.

Let's assume you're planning a "Coaxial Double Bazooka Antenna" such as described in K9EID's *Ham Radio Handbook*, and need to convert its dimensions for 30 meters (see fig. 1). F(14.175) × L(31.24 ft.) = common parameter (442.8). Recalculating for 30 meters: 442.8 ÷ F(10.120) = 43.75 feet overall length. Likewise, F(14.175) × L(23.19) = common parameter 328.71. Recalculating that mid-section for 30 meters gives 328.71 ÷ F(10.120) = 32.48 feet. We'll let you calculate the end sections. They should tally to 5.63 feet each. If you build this outstanding antenna, incidentally, Bob emphasizes the coax is older type RG58 with solid center conductor and tough semiclear dielectric. Other types have different velocity factors which require recalculating lengths.

Shifting toward inexpensive multiband antenna designs, the ever-popular G5RV trapless doublet is shown in fig 2. This antenna is also included in K9EID's handbook, and several amateurs report that it works very well on 30 meters—plus 80, 40, 20, 15, and 10 meters. Remember to

use heavy twin lead for the phasing section if you run high power on other bands. A balun isn't necessary, but an antenna matchbox may be required for loading modern rigs into the 2:5 or 3:1 SWR at some frequencies. The antenna radiates very well regardless of SWR, mainly because every part becomes active: phasing section, coax, etc.

The 24 and 18 MHz Bands

Although present sunspot activity continues toward its predicted 1986 minimum, our other two WARC-acquired bands of 12 and 17 meters are beginning to reveal amateur operations from several world areas. There are strong rumors that 12 meters will be open to U.S. amateurs by the time this column appears in print, so monitor W1AW's bulletins or listen closely between 24.880 and 24.980 MHz during late afternoon hours and check what's happening. North/south propagation has been noticed on 12 meters, with Venezuela and Argentina putting fair signals into both the U.S. and Europe. Australians and Europeans are occasionally heard also, mainly when nearby 10 meters is open. Most of the DX on 12 meters runs less than 300 watts, and there's noticeable concern that 1500 watt U.S. limits may obliterate the band's special attractions. Twelve meters will be a "full activity" type band open to General and higher class licensees. A frequency/mode/license breakdown is included in Table I.

What kinds of antennas seem like attractive starters for joining 12 meter action? ZL special wire beams or phased vertical arrays should give a good account of themselves. You can use our previously discussed ideas for frequency scaling their dimensions. Older CB or 10 meter beams can also be (center) loading-coil adapted to 12 meters. An antenna noise bridge and general-coverage receiver should make frequency tuning a snap. As an example, let's say you want to tune the antenna for resonance at 24.900 MHz. Trim the driven element's coils until the noise-bridge-connected receiver indicates minimum noise around 24.900 MHz. A reflector element should be 5 percent longer, which can be calculated as follows: 468 ÷ F(24.900) = 18.79 feet (driven element). Next, .05 × 18.79 feet = .94 feet. Adding, 18.79 + .94 = 19.73 feet. Returning to the formula, 468 ÷ 19.73 feet = 23.720 MHz, the reflector's point of resonance, and minimum receiver (bridge) noise. There will probably be some element interaction, so double check/retune elements as necessary.

Although the 17 meter band promises to be a winner, occupancy by U.S. amateurs before 1989 isn't looking likely. Gad! We should be well on the "uphill side" of sunspot cycle 22 by then, and DX probably will be booming. As of late 1984, listening between 18.068 and 18.080 MHz revealed YUs, DLs, Gs, Is, LUs, VKs, plus "special DX" such as VU, TR8, and OY. The BBC frequented 18.080 MHz, while general jammers and buzz saws occasionally infested the band's upper end. Take a listen to 17 meters during afternoon hours of weekends. It's quite interesting. It's a pity we can't join the low-end action.

Band	Frequency	Modes	Licenses	PWR Limits
30	10.100–10.150	CW	General Class or higher	200 watts (see text)
17	18.068–18.168		Undetermined at this time	
12	24.880–24.980	CW, RTTY	General Class or higher	1500 watts (preliminary figure)
12	24.930–24.980	CW, SSB	General Class or higher	1500 watts (preliminary figure)

Table I– Breakdown of WARC bands according to frequencies and modes. Twelve meters may be available to U.S. amateurs by the time this article appears in print. Seventeen meter availability to U.S. amateurs isn't expected anytime soon.

Conclusion

As a means of bringing information together in this WARC-band update, let's review some sunspot-cycle notes. You can compare them with what you've heard during the past, what you hear now, and get a general idea of what's ahead. Cycle 21 began last sunspot minimum during June 1976 with a count of 12. It peaked during December 1979 with a count of 165. September 1984's count was 44, and June 1985's count is predicted as 31. Cycle 21 should bottom (end) around December 1986 to June 1987 with an estimated count of 10 to 14. The previous information was excerpted from W3ASK's Propagation column in December 1984 *CQ*. George Jacobs has been forecasting for many years, and his predictions are quite dependable.

Considering the full HF WARC band situation, I believe that 30 meters is our most promising band. Seventeen meters, however, should give it stiff competition during the 1990s, when we'll probably be using remote-controlled stations and our country will be experiencing renewed interest in quality education and higher technology. U.S. youngsters will then fully realize amateur radio's vast appeal.

73, Dave, K4TWJ